

## Patent claims

1. Force sensor based on an organic field effect transistor (10) applied on a substrate (1; 11), in  
5 which a mechanical force acting on the transistor causes a change in its source-drain voltage or its source-drain current ( $i_D$ ) which corresponds to said force and which can in each case be detected as measurement quantity ( $V_{\text{meas}}$ ,  $I_{\text{meas}}$ ) for the acting force.
- 10 2. Force sensor according to Claim 1, characterized  
in that the organic field effect transistor (10) is a pentacene transistor having an active layer (5) made of  
15 pentacene between its source electrode (7) and its drain electrode (4).
3. Force sensor according to Claim 1 or 2, characterized  
20 in that the substrate (1) comprises for example glass, ceramic, plastic, a polymer film, metal film or paper.
4. Force sensor according to Claim 3, characterized  
25 in that the polymer film of the substrate (1) has, in particular, polyethylene naphthalate (PEN), polyethylene terephthalate (PET), polyimide (PI), polycarbonate and/or polyethene ether ketones (PEEK).
- 30 5. Force sensor according to one of the preceding claims, characterized  
in that the detected measurement quantity ( $V_{\text{meas}}$ ) is the drain-source voltage of the organic field effect  
35 transistor (10), a constant gate-source voltage ( $V_{\text{control}}$ ) and a constant drain current ( $I_{\text{control}}$ ) being present at said transistor at the measurement instant.

6. Force sensor according to one of Claims 1 to 4,  
characterized  
in that the detected measurement quantity is the drain  
current ( $I_{\text{meas}}$ ) of the organic field effect transistor  
(10), a constant gate-source voltage ( $V_{\text{control1}}$ ) and a  
constant drain-source voltage ( $V_{\text{control2}}$ ) being present at  
said transistor at the measurement instant.
7. Pressure sensor using at least one force sensor  
according to one of Claims 1 to 6, the substrate being  
configured as a deformable diaphragm (11) and the  
measurement quantity corresponding to the bending state  
of the diaphragm.
8. One- or two-dimensional position sensor for  
measuring the position of a mechanical force action  
along a line or within an area using a multiplicity of  
force sensors ( $10_1, 10_2, \dots, 10_n$ ) according to one of  
Claims 1 to 6, the force sensors ( $10_1, 10_2, \dots, 10_n$ )  
being arranged at regular distances from one another in  
the form of a one- or two-dimensional matrix on a  
common substrate.
9. One-dimensional position sensor according to Claim  
9,  
characterized  
in that a driving and measuring unit (20) is connected  
or can be connected to the drain or source terminals of  
all the field effect transistors for the purpose of  
driving and detecting the position of the force action.
10. Two-dimensional position sensor according to Claim  
9,  
in which the organic field effect transistors are  
arranged in rows and columns and a driving and  
measuring unit (20) is connected or can be connected to  
the drain or source terminals of all the columns for

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the purpose of driving and detecting the column position of the force action and a row decoder (21) is connected or can be connected to the gate terminals of the organic field effect transistors for row-by-row selection and driving of the organic field effect transistors.

11. Fingerprint sensor using a multiplicity of force sensors according to one of Claims 1 to 6 that are arranged on a common substrate at regular distances in the form of a two-dimensional matrix subdivided into rows and columns, in which case a driving and measuring unit (70) is connected or can be connected to the drain or source terminals of the organic field effect transistors in all columns for the purpose of driving and detecting the column position of the force action and a row decoder (21) is connected or can be connected to the gate terminals of the organic field effect transistors of all the rows for row-by-row selection and detection of the position of the force action in the row direction.

12. Fingerprint sensor according to Claim 11, characterized in that at least one perspiration-resistant protective layer (30, 31; 32) as protection against the ingress of water and organic contaminations is provided above the active layer (5) of the organic field effect transistors.

13. Fingerprint sensor according to Claim 11, characterized in that the protective layer comprises a perfluorinated material, in particular perfluorohexadecane.

14. Fingerprint sensor according to Claim 12, characterized

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in that a first protective layer (30) comprises a hydrophobic material and a second protective layer (31) comprises a hydrophilic polymer which acts as a diffusion barrier against lipophilic contaminants.

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15. Fingerprint sensor according to Claim 14, characterized in that the first protective layer (30) covers the second protective layer (31).

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16. Fingerprint sensor according to Claim 14, characterized in that the second protective layer (31) covers the first protective layer (30).